جامعة طنطا
كلية الهندسة
قسم هندسة الإنتاج والتصميم الميكانيكي

المادة/ إدارة المشروعات
(EPM32H4)
الفرقة الرابعة(اتصالات)

بسم الله الرحمن الرحيم
التاريخ :٢٠١٤/١/٢٣
الزمن : ساعتان

أجب عن الأسئلة الآتية:- (٤٠ درجة)

السؤال الأول:-

١- ما هو المشروع ؟- اكتب نبذة مختصرة عن المراحل التى يمر بها المشروع المقترح للاستثمار.

٢- الجدوى الفنية هي إحدى مكونات دراسة الجدوى الاقتصادية - تكلم باختصارعن الجدوى الفنية.

٣- تكلم بالتفصيل عن عناصر التصنيع.

السؤال الثانى:-

١- ما المخزون؟ - لماذا نحتفظ بالمخزون.

٢- ما هي العوامل التي يترتب عليها نقصان أو زيادة العرض؟

٣- تكلم باختصار عن أنواع الاستثمار.

السؤال الثالث:-

١- ما أهمية المفاضلة بين المشروعات مع شرح لمراحل المفاضلة بين المشروعات.

٢- ما هي الأسس والمبادئ العلمية في اتخاذ القرارات الاستثمارية.

٣- اذكر أهم نقاط الاختلاف بين معايير الربحية التجارية ومعايير الربحية القومية.

السؤال الرابع:-

١- ما هي الإدارة؟ وما الهدف من تعلم الإدارة؟

٢- اكتب نبذة مختصرة عن وظائف الإدارة الخمسة.

- اكتب نبذة مختصرة عن التقرير الخاص بك.

مع أطيب التمنيات بالنجاح
د.م/عبد الفتاح مصطفى خورشد

Tanta University

Electronics and Electrical Communications Department

Total Marks: 125 Marks

Faculty of Engineering

Course Title: Satellite Communications Systems	Course Code: EEC4122	Year: 4th
Date: 21 / 1 / 2014	Allowed Time: 3 Hours	No. of Pages: (2)

الأصلي

Answer the following Questions

Question No 1

[25 Marks]

a. State the Keplerian element set indicating their importance in determining satellites orbits.

b. Discuss the effect of non-spherical Earth on the mean motion calculations.

c. Draw a figure indicating the relation between the eclipse period and the day of the year.

d. Explain in details the block diagram of satellite reception for transponders.

Question No 2

[25 Marks]

a. Differentiate between fixed and demand assignment multiple access techniques.

b. Discuss the different algorithm protocols that can be used to control the multiple access between the satellite and Earth stations.

c. Prove that the normalized throughput for pure ALOHA is given by: $\rho_{n_{ALOHA}} = G_n e^{-2G_n}$

d. Show why s-ALOHA reduces it to $\rho_{n_{s-ALOHA}} = G_n e^{-G_n}$, then compare between them.

Question No 3

[25 Marks]

a. Explain the traveling wave tube amplifier indicating its importance, operation, and the gain characteristics.

b. Explain the operation of reservation ALOHA including illustrations for its modes.

c. Clarifies the operation of FDM/FM/FDMA as an example for multiple access of 60 telephone channels between 6 Earth stations via satellite in INTELSAT.

d. Explain in details the operation of SPADE system including the action of common signaling channel.

Question No 4

[25 Marks]

a. Draw and comment on the *European E-Carrier* standard for PCM transmission.

b. Describe the detailed specifications of the high rate TDMA for Europe and show how it could be fulfilled?

c. Draw the general block diagram of spread spectrum illustrating the signal flow from a certain transmitter to the required destination.

d. Express and write what do you know about the process gain and the jamming margin indicating their importance?

Question No 5

[25 Marks]

a. Differentiate between the transmitted reference and stored reference in spread spectrum communications.

b. What are the randomness properties that make a pseudorandom signal appear truly random?

c. Use the shift register to produce PN sequences, and show how to ensure the conditions of randomness on its output.

d. Estimate the normalized autocorrelation function with a single shift for the shift register sequence output given in part c.

Best Wishes

٤ اسئلة

Tanta University — Department: Electronics and Electrical Communication Eng. — Faculty of Engineering

Total Marks: 90 Marks

Course Title: Telecommunication Networks	**Course Code: EEC 4124**	**Year: 4th**
Date: 16/1/ 2014	**Allowed time: 3 hours**	**No. of Pages: (2)**

Remarks: (attempt to answer the following questions ... assume any missing data ... answers should be supported by equations and sketches)

Question (1) *[18 degree]*

(a) Show that, if the assumption of statistical equilibrium for traffic is achieved, the probability of the system being in state i is given in terms of the probability that it is in state 0; (support your answer with equations and sketches). [4 degree]

(b) A remotely located concentrator has 20 subscribers and 4 trunks. The call rate per user is 0.05 calls per minute; with call duration of 2 minutes. Calculate the blocking probability, and the channel utilization, (neglect small internal traffic). [4 degree]

(c) There are two trunk groups are used between two switching offices. The first group has 12 channels and the second group has 6 channels. If the first group; handling 64 call trials per hour with 10 minutes expected duration. What is the blocking probability of the first group? If the overflow traffic from the first group is offered to the second one; determine the blocking probability of the second group, and the probability that both groups are blocked simultaneously. Compare your result to the probability of one 18-channels trunk group. Comment clearly on your results. (Hint: use Erlang's table) . [10 degree]

Question (2) *[20 degree]*

(a) Apply the following sentence for system "Time congestion doesn't necessitate call congestion". [4 degree]

(b) Consider an M/M/N delay system; deduce an expression for the delay traffic. [4 degree]

(c) Consider a single channel delay system M/M/1; deduce an expression for the following parameters: probability of finding j call trials, delay probability, and average number of customers in the system. [6 degree]

(d) Consider a single channel delay system. In a busy hour, 18 calls are offered to the system, each of 2 minutes duration. Calculate:

i. The probability that an arriving call is delayed [2 degree]
ii. The average number of customers that may exist in the system. [2 degree]
iii. The probability that there are less than 6 users in the system. [2 degree]

Question (3) *[18 degree]*

(a) Sketch the timing diagram for circuit switching and packet switching system (datagram and virtual circuit). [3 degree]

(b) What are the functions of signaling system; give an example for the use of these control signals? [6 degree]

(c) It is required to transfer a message with size 80 k bytes on a communication network by 5 nodes, from the user to the server. The data rate for all links is 2 Mbps. The packet size is 1k bits and 100 bits as a header. The setup time is 0.12 sec, with processing time of 0.08 sec at

each node, while the average queuing delay at each node is 0.2 sec. The propagation speed over a link is 500 m/sec, where the hop distance is 60 km. Calculate the end-to-end delay time for the following cases:-

(i) Circuit switching network. [3 degree]
(ii) Datagram packet switching network. [3 degree]
(iii) Virtual circuit packet switching network [3 degree]

Question (4) ***[16 degree]***

(a) Define the following terms, TC, EUF, and CCI. [3 degree]

(b) For a single-stage switch (100x100), find number of cross-points and maximum load for both folded and non-folded switch. [4 degree]

(c) Deduce an expression for the minimum number of cross-points of a non-blocking three-stage switch. [4 degree]

(d) Show that full availability for three-stage switching isn't sufficient condition for non-blocking case, Give an example (Hint: use N=16, n=4). [5 degree]

Question (5) ***[18 degree]***

(a) For a three-stage (200x200) switch with k=4 and n=20.

(i) Design the circuit for this switch. [4 degree]
(ii) Calculate the number of switching elements, and compare this result with that of single-stage switch. [4 degree]
(iii) Repeat (ii) using minimum number of cross-points. [4 degree]

(a) For a three-stage switch shown in Figure (1), an input line is busy 10% of the time. [6 degree]

(i) Estimate the percent of time, p_1; that a line between the first and second stage is busy.
(ii) Show how does this p_1; affect the blocking performance of the intermediate crossbar switch?
(iii) What is the proportion of time, p_2; that a line between the second and third stage is busy?

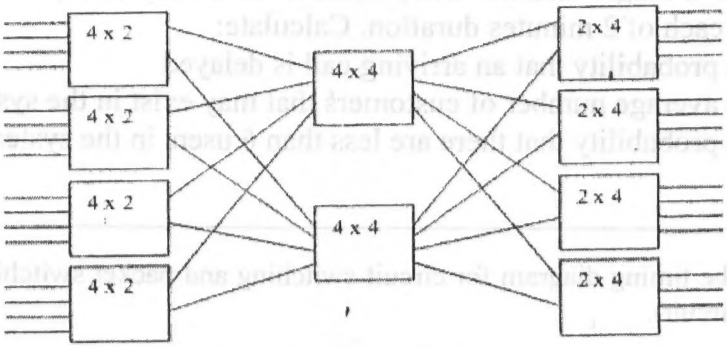


Figure (1)

Best Wishes of Success

44	24.33	26.53	27.64	30.80	32.54	34.68	38.56	43.09	47.09	51.09	59.92	71.01
45	25.08	27.32	28.45	31.66	33.43	35.61	39.55	44.17	48.25	52.32	61.35	72.67
46	25.83	28.11	29.26	32.52	34.32	36.53	40.55	45.24	49.40	53.56	62.77	74.33
47	26.59	28.90	30.07	33.38	35.22	37.46	41.54	46.32	50.56	54.80	64.19	76.00
48	27.34	29.70	30.88	34.25	36.11	38.39	42.54	47.40	51.71	56.03	65.61	77.66
49	28.10	30.49	31.69	35.11	37.00	39.32	43.53	48.48	52.87	57.27	67.04	79.32
50	28.87	31.29	32.51	35.98	37.90	40.26	44.53	49.56	54.03	58.51	68.46	80.99
51	29.63	32.09	33.33	36.85	38.80	41.19	45.53	50.64	55.19	59.75	69.88	82.65
52	30.40	32.90	34.15	37.72	39.70	42.12	46.53	51.73	56.35	60.99	71.31	84.32
53	31.17	33.70	34.98	38.60	40.60	43.06	47.53	52.81	57.50	62.22	72.73	85.98
54	31.94	34.51	35.80	39.47	41.51	44.00	48.54	53.89	58.66	63.46	74.15	87.65
55	32.72	35.32	36.63	40.35	42.41	44.94	49.54	54.98	59.82	64.70	75.58	89.31
56	33.49	36.13	37.46	41.23	43.32	45.88	50.54	56.06	60.98	65.94	77.00	90.97
57	34.27	36.95	38.29	42.11	44.22	46.82	51.55	57.14	62.14	67.18	78.43	92.64
58	35.05	37.76	39.12	42.99	45.13	47.76	52.55	58.23	63.31	68.42	79.85	94.30
59	35.84	38.58	39.96	43.87	46.04	48.70	53.56	59.32	64.47	69.66	81.27	95.97
60	36.62	39.40	40.80	44.76	46.95	49.64	54.57	60.40	65.63	70.90	82.70	97.63
61	37.41	40.22	41.63	45.64	47.86	50.59	55.57	61.49	66.79	72.14	84.12	99.30
62	38.20	41.05	42.47	46.53	48.77	51.53	56.58	62.58	67.95	73.38	85.55	101.0
63	38.99	41.87	43.31	47.42	49.69	52.48	57.59	63.66	69.11	74.63	86.97	102.6
64	39.78	42.70	44.16	48.31	50.60	53.43	58.60	64.75	70.28	75.87	88.40	104.3
65	40.58	43.52	45.00	49.20	51.52	54.38	59.61	65.84	71.44	77.11	89.82	106.0
66	41.38	44.35	45.85	50.09	52.44	55.33	60.62	66.93	72.60	78.35	91.25	107.6
67	42.17	45.18	46.69	50.98	53.35	56.28	61.63	68.02	73.77	79.59	92.67	109.3
68	42.97	46.02	47.54	51.87	54.27	57.23	62.64	69.11	74.93	80.83	94.10	111.0
69	43.77	46.85	48.39	52.77	55.19	58.18	63.65	70.20	76.09	82.08	95.52	112.6
70	44.58	47.68	49.24	53.66	56.11	59.13	64.67	71.29	77.26	83.32	96.95	114.3
71	45.38	48.52	50.09	54.56	57.03	60.08	65.68	72.38	78.42	84.56	98.37	116.0
72	46.19	49.36	50.94	55.46	57.96	61.04	66.69	73.47	79.59	85.80	99.80	117.6
73	47.00	50.20	51.80	56.35	58.88	61.99	67.71	74.56	80.75	87.05	101.2	119.3
74	47.81	51.04	52.65	57.25	59.80	62.95	68.72	75.65	81.92	88.29	102.7	120.9
75	48.62	51.88	53.51	58.15	60.73	63.90	69.74	76.74	83.08	89.53	104.1	122.6
76	49.43	52.72	54.37	59.05	61.65	64.86	70.75	77.83	84.25	90.78	105.5	124.3
77	50.24	53.56	55.23	59.96	62.58	65.81	71.77	78.93	85.41	92.02	106.9	125.9
78	51.05	54.41	56.09	60.86	63.51	66.77	72.79	80.02	86.58	93.26	108.4	127.6
79	51.87	55.25	56.95	61.76	64.43	67.73	73.80	81.11	87.74	94.51	109.8	129.3
80	52.69	56.10	57.81	62.67	65.36	68.69	74.82	82.20	88.91	95.75	111.2	130.9
81	53.51	56.95	58.67	63.57	66.29	69.65	75.84	83.30	90.08	96.99	112.6	132.6
82	54.33	57.80	59.54	64.48	67.22	70.61	76.86	84.39	91.24	98.24	114.1	134.3
83	55.15	58.65	60.40	65.39	68.15	71.57	77.87	85.48	92.41	99.48	115.5	135.9
84	55.97	59.50	61.27	66.29	69.08	72.53	78.89	86.58	93.58	100.7	116.9	137.6
85	56.79	60.35	62.14	67.20	70.02	73.49	79.91	87.67	94.74	102.0	118.3	139.3
86	57.62	61.21	63.00	68.11	70.95	74.45	80.93	88.77	95.91	103.2	119.8	140.9
87	58.44	62.06	63.87	69.02	71.88	75.42	81.95	89.86	97.08	104.5	121.2	142.6
88	59.27	62.92	64.74	69.93	72.82	76.38	82.97	90.96	98.25	105.7	122.6	144.3
89	60.10	63.77	65.61	70.84	73.75	77.34	83.99	92.05	99.41	107.0	124.0	145.9
90	60.92	64.63	66.48	71.76	74.68	78.31	85.01	93.15	100.6	108.2	125.5	147.6
91	61.75	65.49	67.36	72.67	75.62	79.27	86.04	94.24	101.8	109.4	126.9	149.3
92	62.58	66.35	68.23	73.58	76.56	80.24	87.06	95.34	102.9	110.7	128.3	150.9
93	63.42	67.21	69.10	74.50	77.49	81.20	88.08	96.43	104.1	111.9	129.8	152.6
94	64.25	68.07	69.98	75.41	78.43	82.17	89.10	97.53	105.3	113.2	131.2	154.3
95	65.08	68.93	70.85	76.33	79.37	83.13	90.12	98.63	106.4	114.4	132.6	155.9
96	65.92	69.79	71.73	77.24	80.31	84.10	91.15	99.72	107.6	115.7	134.0	157.6
97	66.75	70.65	72.61	78.16	81.25	85.07	92.17	100.8	108.8	116.9	135.5	159.3
98	67.59	71.52	73.48	79.07	82.18	86.04	93.19	101.9	109.9	118.2	136.9	160.9
99	68.43	72.38	74.36	79.99	83.12	87.00	94.22	103.0	111.1	119.4	138.3	162.6
100	69.27	7~.25	75.24	80.91	84.06	87.97	95.24	104.1	112.3	120.6	139.7	164.3

N is the number of servers. The numerical column headings indicate blocking probability B in %. Table generated by Dan Dexter

Erlang B Traffic Table

Maximum Offered Load Versus B and N

B is in %

N/B	0.01	0.05	0.1	0.5	1.0	2	5	10	15	20	30	40
1	.0001	.0005	.0010	.0050	.0101	.0204	.0526	.1111	.1765	.2500	.4286	.6667
2	.0142	.0321	.0458	.1054	.1526	.2235	.3813	.5954	.7962	1.000	1.449	2.000
3	.0868	.1517	.1938	.3490	.4555	.6022	.8994	1.271	1.603	1.930	2.633	3.480
4	.2347	.3624	.4393	.7012	.8694	1.092	1.525	2.045	2.501	2.945	3.891	5.021
5	.4520	.6486	.7621	1.132	1.361	1.657	2.219	2.881	3.454	4.010	5.189	6.596
6	.7282	.9957	1.146	1.622	1.909	2.276	2.960	3.758	4.445	5.109	6.514	8.191
7	1.054	1.392	1.579	2.158	2.501	2.935	3.738	4.666	5.461	6.230	7.856	9.800
8	1.422	1.830	2.051	2.730	3.128	3.627	4.543	5.597	6.498	7.369	9.213	11.42
9	1.826	2.302	2.558	3.333	3.783	4.345	5.370	6.546	7.551	8.522	10.58	13.05
10	2.260	2.803	3.092	3.961	4.461	5.084	6.216	7.511	8.616	9.685	11.95	14.68
11	2.722	3.329	3.651	4.610	5.160	5.842	7.076	8.487	9.691	10.86	13.33	16.31
12	3.207	3.878	4.231	5.279	5.876	6.615	7.950	9.474	10.78	12.04	14.72	17.95
13	3.713	4.447	4.831	5.964	6.607	7.402	8.835	10.47	11.87	13.22	16.11	19.60
14	4.239	5.032	5.446	6.663	7.352	8.200	9.730	11.47	12.97	14.41	17.50	21.24
15	4.781	5.634	6.077	7.376	8.108	9.010	10.63	12.48	14.07	15.61	18.90	22.89
16	5.339	6.250	6.722	8.100	8.875	9.828	11.54	13.50	15.18	16.81	20.30	24.54
17	5.911	6.878	7.378	8.834	9.652	10.66	12.46	14.52	16.29	18.01	21.70	26.19
18	6.496	7.519	8.046	9.578	10.44	11.49	13.39	15.55	17.41	19.22	23.10	27.84
19	7.093	8.170	8.724	10.33	11.23	12.33	14.32	16.58	18.53	20.42	24.51	29.50
20	7.701	8.831	9.412	11.09	12.03	13.18	15.25	17.61	19.65	21.64	25.92	31.15
21	8.319	9.501	10.11	11.86	12.84	14.04	16.19	18.65	20.77	22.85	27.33	32.81
22	8.946	10.18	10.81	12.64	13.65	14.90	17.13	19.69	21.90	24.06	28.74	34.46
23	9.583	10.87	11.52	13.42	14.47	15.76	18.08	20.74	23.03	25.28	30.15	36.12
24	10.23	11.56	12.24	14.20	15.30	16.63	19.03	21.78	24.16	26.50	31.56	37.78
25	10.88	12.26	12.97	15.00	16.13	17.51	19.99	22.83	25.30	27.72	32.97	39.44
26	11.54	12.97	13.70	15.80	16.96	18.38	20.94	23.89	26.43	28.94	34.39	41.10
27	12.21	13.69	14.44	16.60	17.80	19.27	21.90	24.94	27.57	30.16	35.80	42.76
28	12.88	14.41	15.18	17.41	18.64	20.15	22.87	26.00	28.71	31.39	37.21	44.41
29	13.56	15.13	15.93	18.22	19.49	21.04	23.83	27.05	29.85	32.61	38.63	46.07
30	14.25	15.86	16.68	19.03	20.34	21.93	24.80	28.11	31.00	33.84	40.05	47.74
31	14.94	16.60	17.44	19.85	21.19	22.83	25.77	29.17	32.14	35.07	41.46	49.40
32	15.63	17.34	18.21	20.68	22.05	23.73	26.75	30.24	33.28	36.30	42.88	51.06
33	16.34	18.09	18.97	21.51	22.91	24.63	27.72	31.30	34.43	37.52	44.30	52.72
34	17.04	18.84	19.74	22.34	23.77	25.53	28.70	32.37	35.58	38.75	45.72	54.38
35	17.75	19.59	20.52	23.17	24.64	26.44	29.68	33.43	36.72	39.99	47.14	56.04
36	18.47	20.35	21.30	24.01	25.51	27.34	30.66	34.50	37.87	41.22	48.56	57.70
37	19.19	21.11	22.08	24.85	26.38	28.25	31.64	35.57	39.02	42.45	49.98	59.37
38	19.91	21.87	22.86	25.69	27.25	29.17	32.62	36.64	40.17	43.68	51.40	61.03
39	20.64	22.64	23.65	26.53	28.13	30.08	33.61	37.72	41.32	44.91	52.82	62.69
40	21.37	23.41	24.44	27.38	29.01	31.00	34.60	38.79	42.48	46.15	54.24	64.35
41	22.11	24.19	25.24	28.23	29.89	31.92	35.58	39.86	43.63	47.38	55.66	66.02
42	22.85	24.97	26.04	29.09	30.77	32.84	36.57	40.94	44.78	48.62	57.08	67.68
43	23.59	25.75	26.84	29.94	31.66	33.76	37.57	42.01	45.94	49.85	58.50	69.34

٢٠١٤/١/١٢ امتحان

Tanta University	Department of Electronics and Electrical Communication Engineering	Faculty of Engineering

Course Title: **Elective Course (3) Data Security,**
Course Code:EEC4234, Students: **4th year.**
Date: **Sun.,12-Jan.-2014,** Time Allowed: **Three hours,** No. of Pages: **2.**
Total Marks: **85**

Answer the following questions:

The first question [15 marks]

a. Encrypt the message "**a good day**" using a shift cipher with a key of 19. Then, show how to decrypt the message to get the original plain text.

b. Encrypt the word: "**goodbye**" using a cipher that replaces each character with position ***a*** (A has a=0, B has a=1, ... etc.) by another character with position $f(a) = (3a + k_i) mod\ n$. (n= 23 and K_i is equal to 13 for the 1st character, 17 for the 2nd, and 19 for the 3rd and then K_i is repeated 13, 17, 19,13,17,19...etc.). What is the type of this cipher?

c. Compare the RSA to the DES encryption algorithms.

The second question [15 marks]

a. With the aid of sketches, explain the security problem: Man-in-the-Middle attack in the Diffie-Hellman protocol.

b. Consider the Diffie–Hellman key exchange protocol. Assume that Eve runs an active man-in-the-middle attack against the key exchange. For the Diffie–Hellman key exchange, use the parameters p = 29, g = 2, and x = 13, y = 7 for Alice and Bob, respectively. Eve uses the value z = 11. Compute the key pairs K_{AO} and K_{BO} indicating:
   i The formulas with which Eve computes them.
   ii The formulas with which Alice and Bob compute them.
   iii What is the solution to this attack?

The third question [20 marks]

a. Define *Kerberos* servers. Using diagrams, explain what happens when a user want to access a real server. Define all terms and symbols used.

b. What do you know about the meaning of X.509 protocol?

c. What is the HMAC? And what is its advantage?

The fourth question [20 marks]

a. With the aid of sketches, briefly explain the key management methods for public key distribution in asymmetric key cryptography.

b. What is meant by a Hash function? What are the criteria that must be associated with a Hash function to achieve the required security?

c. A message is made of 10 characters. A hash algorithm creates a digest out of this message by choosing characters which position are prime numbers. Deduce, if this algorithm meets the criteria of the Hash function?

The fifth question [15 marks]

a. What is meant by "message nonrepudiation"? Does the digital signature provide this service? Explain your answer.

b. Why is it a good idea to hash passwords that are stored in a file? What is a "salt" and why should a salt be used whenever passwords are hashed?

c. Suppose that all passwords on a given system are 4 characters long. The chosen characters may be numbers (0 to 9), *capital* or *small* letters from (A to E), and _ (underscore). How many different passwords combinations in this system?

Good Luck *Dr. Sameh A. Napoleon*

Electronics and Electrical Comm. Dept.
Total Marks: 90 Marks

Course Title: **Wave Propagation and Antennas (2)**	Course Code: EEC 3123	Year: 4th
Date: Jan, 2014-1-9	Allowed Time: 3 Hours	No. of Pages: (2)

Answer the following questions:

Question (1) [18 marks]

(a) **Compare** between the null-to-null beamwidth of a rectangular aperture antenna of dimensions $(a \times a)$ and a circular aperture antenna of radius $r = a$.

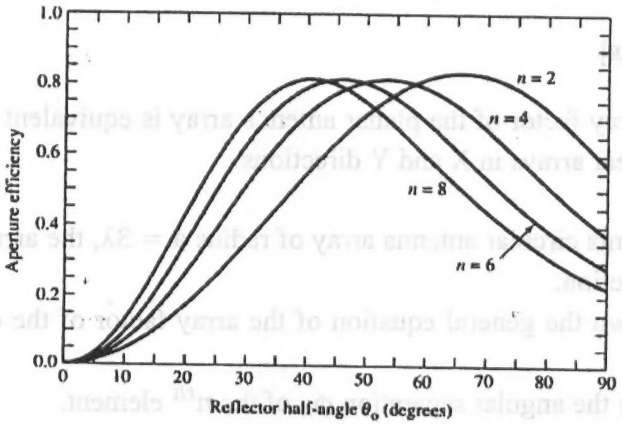
(b) For a $(3\lambda \times 3\lambda)$ rectangular waveguide (aperture antenna) fed with T_{E10} mode with electric field oriented in Y-direction where $|E_y| = E_o \sin\left(\frac{\pi}{a}\right)x'$. Draw the E-plane and H-plane patterns.

Question (2) [18 marks]

(a) **Derive** the expression that relates the parabolic reflector antenna parameters (F, d, θ_o).

(b) **State** the advantages of the parabolic reflector antenna.

(c) A parabolic reflector antenna with $F/d = 0.5$ has a prime-focus feed with a gain function $G(\theta) = 14\cos^n(\theta)$. **Evaluate** the order n of the feeder. **Find** the diameter of the reflector in order to obtain an antenna gain of 30dB at 10GHz. **Find** the antenna efficiency.



Question (3) [18 marks]

(a) **Explain** how the Hansen-Woodward antenna array is used to increase the directivity of the end fire array. **Derive** an expression for the maximum element spacing d_{max} required to avoid the grating lobe in the Hansen-Woodward array.

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Electronics and Electrical Comm. Dept.
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(b) Consider N=6 dipole elements separated by $d = \lambda/2$ with uniform feeding and progressive phase shift $\alpha = \pi$. If the dipoles are placed on Z-axis, and oriented towards Y-axis.

1. Determine the array type.
2. Plot only the array factor.
3. Determine the HPBW and the directivity of the array.
4. Determine the peak value of the first side lobe level.
5. If it is required to steer the main lobe towards $\theta_o = 60^\circ$, design the feeding network.

Question (4) [18 marks]

(a) **Explain** why the side lobes of the Tschebyscheff array are of the same level.

(b) What is the main factor that affects the half power beamwidth of the binomial array?

(c) Consider a broadside binomial array consisting of $N = 6$ antenna elements with uniform element spacing $d = \lambda/2$. The array elements are short monopoles placed in Y-axis and oriented in X-direction.

1. Determine the excitation coefficients of the array elements.
2. Plot the array factor and the total field pattern.
3. State the advantages and disadvantages of the array.

Question (5) [18 marks]

(a) **Prove** that the array factor of the planar antenna array is equivalent to the product of the array factors of two linear arrays in X and Y directions.

(b) Consider 8 elements circular antenna array of radius a = 3λ, the array elements are monopoles oriented in Z-direction.

1. **Write** down the general equation of the array factor of the circular array using Bessel form.
2. Determine the angular separation ϕ_n of the n^{th} element.
3. Plot the total field pattern of the array considering broadside direction.

Course Coordinator: *Dr. Amr Hussein*